FOREST FIRES.

Incendies en Forêt. By A. Jacquot. Translated by C. E. C. Fischer. Pp. xv+278. (Calcutta: Superintendent Government Printing, India, 1910.) Price 14 annas, or 1*s.* 3*d.*

THE title of this book, "Incendies en Forêt," is somewhat misleading, as it is in the main a general treatise on the valuation of forest property, and forest fires are only partially treated, in so far as their occurrence necessitates a correct mode of appraisement of the damages caused by them.

The first chapter deals with French law in relation to the punishment of incendiaries, and the legal duties of forest officers. Very little is said about the important subject of the prevention of forest fires. We learn, however, that in France fire is only dreaded in the pine forests of the Landes, and in the broad-leaved forests of districts like the Maures and Esterel, where an arid climate prevails. In Provence the compulsory preventive measures are the maintenance of open rides along the borders of the forest, and the clearing away of brushwood in belts four yards wide on each side of the roads and paths throughout the forest. In the Maures and Esterel, but not elsewhere, the railway companies are obliged by law to clear, at their own expense, belts ten to fifty yards wide on both sides of the permanent way. These fire-lines are too narrow to arrest the progress of fire, but serve as bases from which counter-fires can be started.

The bulk of the book deals with the valuation of forests at all ages and of all kinds, a difficult subject, treated carefully and with great detail. The author advocates what he styles the positive mode of valuation. The value of the land itself is estimated by comparison with similar land near at hand, and not by theoretical computations of its timber-producing capacity. The standing crop of merchantable trees is valued as they would be by a timber merchant, namely, by actual measurement of their volume and the price they would fetch in the local market. Young stock, of no actual sale value, is reckoned by discounting at the moment its estimated value at the time when it would be ripe for felling.

Many interesting facts and experiments are mentioned, especially with regard to thinning, which are worth the attention of British foresters. The author shows that thinnings properly executed in coppice—a practice never attempted in England—increase the final yield 50 per cent., and amply repay the small cost of the operation. He declaims against the dense stands of mature trees, which are common in high forests in Germany, alleging that these, although they show more stems, produce a less volume of timber. Thinning is much more drastic in French pine woods than in those of Germany. Pines are light-demanding trees, and heavy thinning secures to each individual the best conditions of light and nutrition, both height and girth increments being stimulated. Moreover, the thinnings yield a considerable revenue, often surpassing in value the final crop, and as this is available early, the rate of interest on the capital at stake is materially increased. Thinning is also necessary, where wind is dreaded, as it strengthens the root systems of the trees that are left. In Germany, it is usual to remove only the dead, decaying, and suppressed stems, whereas in France some of the dominant trees, though in full vigour, are removed. It is often believed that growth in height is stimulated by dense crops, whereas it has been proved by experiments that not only does thinning increase the diameter of the trees left standing, but it also increases their actual height, and improves the form of the stem, which becomes more cylindrical, with an enlarged canopy of foliage. The importance of dense woods at the outset is acknowledged by all, as by their shade the stems are cleaned of their branches, and timber free from knots is produced; but in the later stages of growth there is no doubt of the advantage of the system of judicious repeated thinnings. For oak and beech the effect is the same as for pine.

The disastrous effects of fire upon the soil of the forest is well illustrated by the author, who also enters at some length into the part played by the forest in lessening hailstorms in its vicinity, in improving farm crops by its shelter, and in preventing disastrous floods at a distance.

The book is remarkably cheap, only 1*s.* 3*d.*, and one cannot quarrel with the frequent misprints (*Cf.* p. 17, pendunculate for pedunculate, and holme for holm), and its occasional curious phraseology. It should be of great service in India, and can be read with profit by landowners and foresters in England. It is provided with eighteen pages of useful interest tables.

LIVING MATTER AND ITS FUNCTIONS.

The Evolution and Function of Living Purposive Matter. By N. C. Macnamara. (International Scientific Series.) Pp. xi+298. (London: Kegan Paul, Trench, Trübner and Co., Ltd., 1910.) Price 5*s.*

THE object of this book is to trace and explain the evolution of the functions of those elements of living matter which are essential for the manifestation of purposive, instinctive, and psychical phenomena. The book is divided into two parts; in the first the evidence is given which the author believes proves the gradual evolution of purposive action in protoplasm in the various classes of the animal kingdom, in the second the soundness of these conclusions is put to the test by giving in outline the leading characteristics displayed by the Irish Celts of County Clare—a long line of individuals who lived under conditions well adapted to show the power which their inherited qualities exercised on the actions of many successive generations and on the destinies of the race.

The author believes that protoplasm, even in the lowest living forms, exhibits characteristics which indicate the possession of purposive elements, and that these undergo evolution *pari passu* with those elements which constitute the structural parts of the organism. The author holds that even among the

© 1911 Nature Publishing Group

Protozoa the response to stimuli exhibited by their protoplasm is not simply one of reaction to external stimuli, but is of such a nature that a *purposive* function seems to be postulated, and that protoplasm, even in very lowly forms, as undoubtedly is the case in higher ones, is able to store impressions—possesses, in fact, the rudiments of a memory. From the undifferentiated condition, the next step forward is the development of a rudimentary nervous system, such as occurs in the sponges, then the development of well-marked nervous tissue, its aggregation into ganglionic masses, and eventually the formation of a definite though simple nervous system is traced through the invertebrates, and, finally, the progressive evolution of a nervous system through the vertebrates, culminating in man with his elaborate psychical processes.

Although some would hold that the response of protoplasm to external stimuli is simply one of reaction, we think that the author's view of purposive action in addition is borne out by the facts cited, and that this is inherent in protoplasm, just as the tendency to variation appears to be. With regard to the second part of the book, we are not in a position to criticise its historical accuracy, but it makes interesting reading. The emotional and instinctive qualities displayed by the Irish Celts depends, according to the author, on their hereditary characters rather than on experience and on intellectual acquirements. The book is pleasant and instructive reading, and though here and there not altogether free from error, on the whole is a simple and well-developed exposition of the subject of which it treats.

ANIMAL PSYCHOLOGY.

(1) *L'Evolution de la Mémoire*. By Henri Piéron. Pp. 360. (Paris: Ernest Flammarion, 1910.) Price 3.50 francs.

(2) *Vorlesungen über Tierpsychologie*. By Prof. Karl Camillo Schneider. Pp. xii+310. (Leipzig: W. Engelmann, 1909.) Price 8 marks.

(1) M. PIÉRON'S book is a new addition to that excellent and deservedly famous series, the "Bibliothèque de Philosophie scientifique," and is quite worthy of its place. Its subject is, to say the least, a difficult one, being dependent on the careful interpretation of vast quantities of scattered observations and researches made by students of comparative psychology during quite recent years; but M. Piéron has produced out of this material, some of which is furnished by researches of his own, a volume which is not only compact and thoroughly sound, but also readable.

In an excellent introduction, he criticises certain definitions of memory that have been held in the past, and shows by the help of numerous and interesting examples the continuity, the complete lack of hiatus, in the succession of phenomena commencing with the inorganic memory shown in viscosity, hysteresis, &c., through biological memory, heredity, adaptation, &c., to psychological memory, which is frequently alone allowed the designation memory. The presence of consciousness in psychological memory is important, but not of that essential significance which the more metaphysically-minded among the psychologists are so fond of attributing to it. This is quite clearly shown in researches on the memorising of nonsense syllables (Ebbinghaus) where the curve representing the number of repetitions necessary for completely learning series of varying lengths is found to belong to the same type, to have the same mathematical equation, as that representing monomolecular autocatalytic reactions in chemistry, viz., $\log x = Kt + b$.

The contrast, in fact, is not between subhuman and human memory, but one between memory as it is for the individual himself as he enjoys it in consciousness, and memory as it manifests itself objectively both in himself and in his fellow-man.

The author proceeds to consider the phenomena more in detail, commencing with an interesting description of the "persistances rythmiques" displayed by both plants and animals. In the case of the latter, the best examples are given by marine animals, which live on the seashore and reproduce in their organic functions the rhythm of the tides. The rhythm persists when the animals are removed to a new, non-rhythmical environment, although an observer has found that this is not the case with young individuals that have not experienced the tidal rhythm. Piéron has some interesting comments and criticisms to make on the whole problem.

There follows a clear and concise account of the modern experimental methods of research employed to investigate the processes of adaptation and the formation of habits in animals, and the important researches of Thorndike, Hobhouse, Yerkes, and others are usefully summarised. A chapter on "sensory memory," full of experimentally determined results, completes the part of the volume allotted to subhuman psychology.

The last hundred pages of the book deal with specifically human memory, and summarise in small space an enormous number of experimental investigations. The author points out that the laws of rate of learning and forgetting admit of identical mathematical expression for animals and for men, for the different forms of sensorial and motor memory, &c. The curves correspond to the same general mathematical formula, viz., $y = A/K - B^x$. The non-correspondence of memory and intelligence is noted, and pathological modifications are adequately treated. With a useful chapter on the utilisation of memory, and a conclusion, written in more speculative mood, the book ends.

(2) Prof. Schneider gives in his series of published lectures a very full and decidedly original account of the subject-matter of animal psychology. Regarding the physiological mechanism of the nervous system as capable of producing summation of stimuli only, he finds himself forced to assume an active and efficient "Psyche" to explain most of the phenomena of his science. "Die Psyche assoziiert die einzelnen Eindrücke, die dabei ihre Selbständigheit wahren (Assoziationsorgan), während das Gehirn sie sum-

© 1911 Nature Publishing Group